

## PCT COOPERATION TRL

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 16 October 2000 (16.10.00)	<b>Applicant's or agent's file reference</b> SZ9-98-049
<b>International application No.</b> PCT/IB00/00043	<b>Priority date (day/month/year)</b> 17 February 1999 (17.02.99)
<b>International filing date (day/month/year)</b> 17 January 2000 (17.01.00)	
<b>Applicant</b> BECK, Armin et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

21 August 2000 (21.08.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Maria Victoria CORTIELLO

Telephone No.: (41-22) 338.83.38

PCT COOPERATION TRF

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

WILLIAMS, Julian, Davis  
International Business Machines  
Corporation  
Säumerstrasse 4  
CH-8803 Rüschlikon  
SUISSE

<b>Date of mailing (day/month/year)</b> 16 October 2000 (16.10.00)	<b>IMPORTANT NOTIFICATION</b>
<b>Applicant's or agent's file reference</b> SZ9-98-049	
<b>International application No.</b> PCT/IB00/00043	
<b>International filing date (day/month/year)</b> 17 January 2000 (17.01.00)	

## 1. The following indications appeared on record concerning:

☐ the applicant
     
 ☐ the inventor
     
 ☒ the agent
     
 ☐ the common representative

<b>Name and Address</b> HEUSCH, Christian International Business Machines Corporation Säumerstrasse 4 CH-8803 Rüschlikon Switzerland	<b>State of Nationality</b>	<b>State of Residence</b>
	<b>Telephone No.</b> 41-1-724-8111	
	<b>Facsimile No.</b> 41-1-724-8951	
	<b>Teleprinter No.</b>	

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person
     
 ☐ the name
     
 ☐ the address
     
 ☐ the nationality
     
 ☐ the residence

<b>Name and Address</b> WILLIAMS, Julian, Davis International Business Machines Corporation Säumerstrasse 4 CH-8803 Rüschlikon Switzerland	<b>State of Nationality</b>	<b>State of Residence</b>
	<b>Telephone No.</b> 41-1-724-8111	
	<b>Facsimile No.</b> 41-1-724-8951	
	<b>Teleprinter No.</b>	

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland	<b>Authorized officer</b>  Maria Victoria CORTIELLO
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

A. ENT COOPERATION TRL. 1

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

WILLIAMS, Julian, David  
International Business Machines  
Corporation  
Säumerstrasse 4  
CH-8803 Rüschlikon  
SUISSE

Date of mailing (day/month/year) 07 December 2000 (07.12.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference SZ9-98-049	
International application No. PCT/IB00/00043	International filing date (day/month/year) 17 January 2000 (17.01.00)

1. The following indications appeared on record concerning:	
<input type="checkbox"/> the applicant	<input type="checkbox"/> the inventor
<input checked="" type="checkbox"/> the agent	<input type="checkbox"/> the common representative
Name and Address WILLIAMS, Julian, Davis	State of Nationality
	State of Residence
	Telephone No. 41-1-724-8111
	Facsimile No. 41-1-724-8951
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:	
<input type="checkbox"/> the person	<input checked="" type="checkbox"/> the name
<input type="checkbox"/> the address	<input type="checkbox"/> the nationality
<input type="checkbox"/> the residence	
Name and Address WILLIAMS, Julian, David	State of Nationality
	State of Residence
	Telephone No. 41-1-724-8111
	Facsimile No. 41-1-724-8951
3. Further observations, if necessary: <b>Corrected Version</b>	
4. A copy of this notification has been sent to:	
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Lazar Joseph Panakal
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

WILLIAMS, Julian David  
INTERNATIONAL BUSINESS MACHINES  
CORP. - IBM  
Säumerstraße 4  
8803 Rüschlikon  
SUISSE

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year) 16.05.2001

Applicant's or agent's file reference  
SZ9-98-049

IMPORTANT NOTIFICATION

International application No.  
PCT/IB00/00043

International filing date (day/month/year)  
17/01/2000

Priority date (day/month/year)  
17/02/1999

Applicant  
INTERNATIONAL BUSINESS MACHINES CORPORATION et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
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Authorized officer

Reddy, J

Tel. +49 89 2399-2231



# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SZ9-98-049	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB00/00043	International filing date (day/month/year) 17/01/2000	Priority date (day/month/year) 17/02/1999
International Patent Classification (IPC) or national classification and IPC H01L27/115		
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  21/08/2000	Date of completion of this report  16.05.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Blackley, W  Telephone No. +49 89 2399 2295 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB00/00043

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-21 as originally filed

**Claims, No.:**

3-6,10-21,23,24, as originally filed  
26

1,2,7-9,22,25 as received on 13/02/2001 with letter of 06/02/2001

**Drawings, sheets:**

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB00/00043

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-26
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-26
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: US-A-5 623 439

D2: US-A-5 723 885

D3: US-A-3 663 458

D4: US-A-4 767 729

2. D1 discloses, see in particular Fig 1 and column 4, lines 15-46, a ferroelectric memory device having a region of  $\text{SrTiO}_3$  doped with Nb (0.006 wt%) between electrodes. As described in column 5, lines 1-34, binary information is stored in the device by applying different voltage pulses across the electrodes to induce a polarization in the ferroelectric gate insulation film.
3. Although  $\text{SrTiO}_3$  is a substance comprising  $\text{A}_x\text{B}_y\text{O}_z$  as defined in claim 1 and Nb is a transition metal, the device of claim 1 differs from that described in D1 in that the substance comprising doped  $\text{A}_x\text{B}_y\text{O}_z$  forms a switchable ohmic resistance which is reversibly switchable between different states in response to the application of different voltage pulses to the electrodes, each different state corresponding to a different value of stored information. In the device of D1, the doped material merely forms a conductive channel in a FET structure.
4. The subject-matter of claim 1 is therefore new (Art 33(2) PCT).
5. The subject-matter of claim 1 is similarly new with respect to D3, see Example 2 and Tables 4 and 5 in columns 5-6, and D4, see whole document.
6. Furthermore, none of the presently available prior art documents appear to suggest applying such a switchable ohmic resistance as defined in claim 1. The subject-matter of claim 1 thus involves an inventive step (Art 33(3) PCT).
7. Method claims 19-20, 22, 24 also appear to be new and inventive as a



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB00/00043

consequence of their dependency on claim 1 through 17. Use claims 25 and 26 appear also to be novel for the same reasons as given above, mutatis mutandis.

8. Device claims 2-18 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**Re Item VII**

**Certain defects in the international application**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D3 is not mentioned in the description, nor are these documents identified therein.

## CLAIMS

1. A microelectronic device for storing digital information, the device having a switchable ohmic resistance between electrodes (12, 16), which ohmic resistance is reversibly switchable between different states (1, 2, 3, 4) in response to application of different voltage pulses (5, 5.1, 6, 6.1, 7, 8) to the electrodes (12, 16), each different state (1, 2, 3, 4) corresponding to a different value of stored information; wherein the ohmic resistance is formed from a substance comprising components  $A_x$ ,  $B_y$ , and oxygen  $O_z$ , in which substance
- 10 said component A is a member of Alkaline metals (group IA), or Alkaline Earth metals (group IIA), or Rare Earth elements, or Scandium, or Yttrium, said component B is a transition metal being member of one of the groups IB to VIII, or a member of one of the groups IIIA, IVA, VA,
- 15 said substance comprising a dopant of one of or a combination of different transition metals, the total dopant amount being larger than 0% and smaller than 5%.
2. The microelectronic device according to claim 1, wherein the ohmic resistance is switchable between at least a first state (1) of the different states and a second state (2) of the different states by applying to the electrodes (12, 16) a first voltage pulse (5.1) of the different voltage pulses for switching from said second state (2) to said first state (1) or a second voltage pulse (6.1) of the different voltage pulses for switching from said first state (1) to said second state (2).
- 25 3. The microelectronic device according to claim 2, wherein the ohmic resistance in the first state (1) is higher than in the second state (2) and wherein the first voltage pulse (5.1) of the different voltage pulses for switching to said first state (1) has an opposite sign to the second pulse (6.1) of the different voltage pulses for switching to said second state (2).

## Replacement sheet

- 23 -

4. The microelectronic device according to claim 1, wherein each of the different states (1, 2, 3, 4) is obtainable by an erase pulse (5) for switching the ohmic resistance in the region (14) to a high ohmic state (1) of the different states and/or at least one write pulse (6, 7, 8) for switching from said high ohmic state (1) to a lower ohmic state (2, 3, 4) of the different states .
5. The microelectronic device according to claim 4, wherein the erase pulse (5) has different amplitudes for switching to one of the lower ohmic states (2, 3, 4).
6. The microelectronic device according to one of claims 1 to 4, wherein the different states (1, 2, 3, 4) are readable by a read voltage (9) smaller in magnitude than the different voltage pulses (5, 5.1, 6, 6.1, 7, 8) applied for switching to the different states (1, 2, 3, 4).
7. The microelectronic device according to claim 1 being usable as a capacitor-like structure, wherein the ohmic resistance represents a dielectric.
8. The microelectronic device according to claim 1, whereby a specific ohmic resistance related to one of the different states (1, 2, 3, 4) remains after one of the different voltage pulses (5, 5.1, 6, 6.1, 7, 8) that leads to said specific ohmic resistance has been applied to the electrodes (12, 16).
9. The microelectronic device according to one of the preceding claims being able to store digital information that is representable by different values in ohmic resistance of a region (14), thereby preferably storing two or more bits as digital information.
10. The microelectronic device according to claim 1, in which the combinations of indices  $x$ ,  $y$  and  $z$  of the substance are definable by  
 $x = n + 2$ ,  $y = n + 1$ ,  $z = 3n + 4$ , with  $n = 0, 1, 2, 3$ ; or  
 $x = n + 1$ ,  $y = n + 1$ ,  $z = 3n + 5$ , with  $n = 1, 2, 3, 4$ .

18. A semiconductor device comprising a microelectronic device according to one of the preceding claims 1 to 16.
19. A method for writing information into a memory cell arrangement according to  
5 claim 17 comprising the step of:  
applying one voltage pulse of the different voltage pulses (5, 6, 7, 8) to the electrodes (12, 16) of said memory cell arrangement for writing information into it.
20. The method according to claim 19, wherein the ohmic resistance in the region (14)  
10 is switched between at least a first state (1) of the different states and a second state (2) of the different states by applying to the electrodes (12, 16) a first voltage pulse (5.1) of the different voltage pulses for switching from said second state (2) to said first state (1) or a second voltage pulse (6.1) of the different voltage pulses for switching from said first state (1) to said second state (2).  
15
21. The method according to claim 20, wherein the ohmic resistance in the first state (1) is higher than in the second state (2) and wherein the first voltage pulse (5.1) for switching to said first state (1) has an opposite sign to the second voltage pulse (6.1) for switching to said second state (2).  
20
22. The method according to claim 19, wherein each of the different states (1, 2, 3, 4) are obtained by an erase pulse (5) for switching the ohmic resistance to a high ohmic state (1) of the different states and/or at least one write pulse (6, 7, 8) for switching from said high ohmic state (1) to a lower ohmic state (2, 3, 4) of the  
25 different states corresponding to said write pulse (6, 7, 8).
23. The method according to claim 22, wherein the erase pulse (5) has different amplitudes for switching to one of the lower ohmic states (2, 3, 4).

24. A method for reading information out of a memory cell arrangement according to claim 17 comprising the steps of:  
applying a read voltage (9) to said memory cell arrangement and  
associating with this information a value of current flowing through said memory  
5 cell arrangement; or  
applying a current pulse to said memory cell arrangement and  
associating with this information a value of voltage appearing between the  
electrodes (12, 16) of said memory cell arrangement.
- 10 25. Use of a substance for storing digital information, the substance comprising  
components  $A_x$ ,  $B_y$ , and oxygen  $O_z$ , for making a switchable ohmic resistance  
within a capacitor-like structure, in which substance  
said component A is a member of Alkaline metals (group IA), or Alkaline Earth  
metals (group IIA), or Rare Earth elements, or Scandium, or Yttrium,  
15 said component B is a transition metal being member of one of the groups IB to  
VIII, or a member of one of the groups IIIA, IVA, VA,  
said substance comprises a dopant of one of or a combination of different transition  
metals, the total dopant amount being larger than 0% and smaller than 5%.
- 20 26. Use of a substance according to the preceding claim, whereby the combinations of  
indices x, y and z are defined by  
 $x = n + 2$ ,  $y = n + 1$ ,  $z = 3n + 4$ , with  $n = 0, 1, 2, 3$ ; or  
 $x = n + 1$ ,  $y = n + 1$ ,  $z = 3n + 5$ , with  $n = 1, 2, 3, 4$ ; or  
being defined by either of:  
25  $x = 1$ ,  $y = 1$ ,  $z = 1$ , and one of the indices x or y being 0, or  
 $x = n$ ,  $y = n$ ,  $z = n + 1$ , with  $n = 1$  or 2 and one of the indices x or y being 0, or  
 $x = n$ ,  $y = n$ ,  $z = 2n + 1$ , with  $n = 2$  and one of the indices x or y being 0; or  
being defined by  
 $x = n$ ,  $y = n$ ,  $z = 3n$ , with  $n = 1$ , or 2, or 3; or  
30  $x = n + 1$ ,  $y = n$ ,  $z = 4n + 1$ , with  $n = 1$ , or 2.

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>SZ9-98-049</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/IB 00/ 00043</b>	International filing date (day/month/year) <b>17/01/2000</b>	(Earliest) Priority Date (day/month/year) <b>17/02/1999</b>
Applicant <b>INTERNATIONAL BUSINESS MACHINES CORPORATION et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1

☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IB 00/00043

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L27/115 H01L29/51 G11C11/22 C04B35/46

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L C04B G11C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 623 439 A (YOSHIDA AKIRA ET AL) 22 April 1997 (1997-04-22)  figures 1-3,5-8 column 2, line 59 -column 3, line 46 column 4, line 15 -column 6, line 31 column 6, line 65 -column 8, line 55	1,2,4, 7-9,12, 17-20, 22,24-26
Y		3,5,6, 21,23
A		10,11, 13-16
	— — — — — -/-	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

15 March 2000

Date of mailing of the international search report

29/03/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Polesello, P

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IB 00/00043

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 723 885 A (OOISHI TSUKASA) 3 March 1998 (1998-03-03) figures 1,5-9,11 column 7, line 40 -column 8, line 3 column 8, line 49 -column 12, line 15 column 14, line 23 -column 14, line 46	3,5,6, 21,23
A	—	12
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